

The Mining Journal

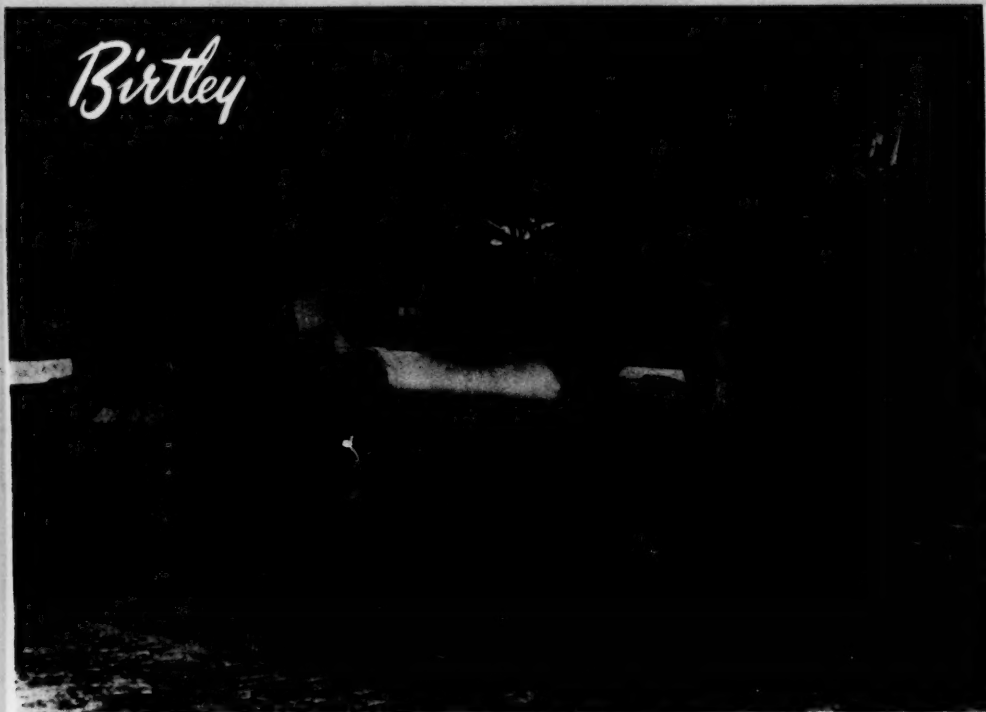
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LONDON, JANUARY 25, 1953

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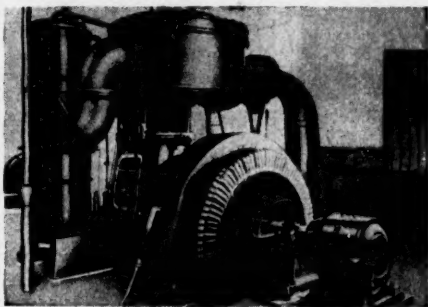
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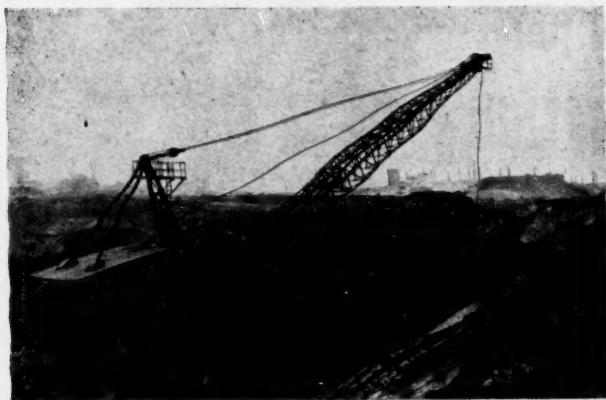
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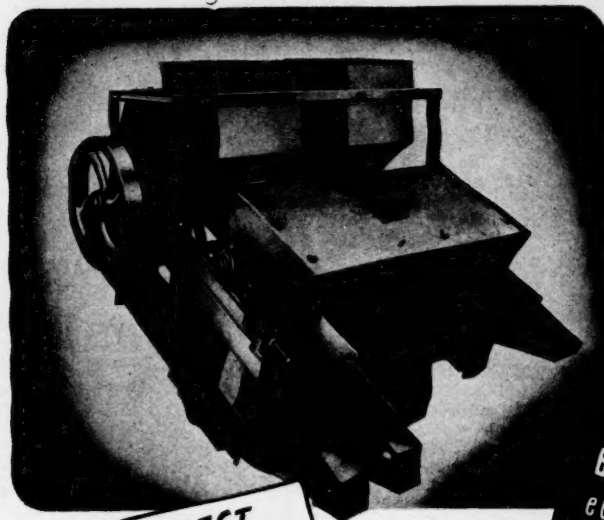
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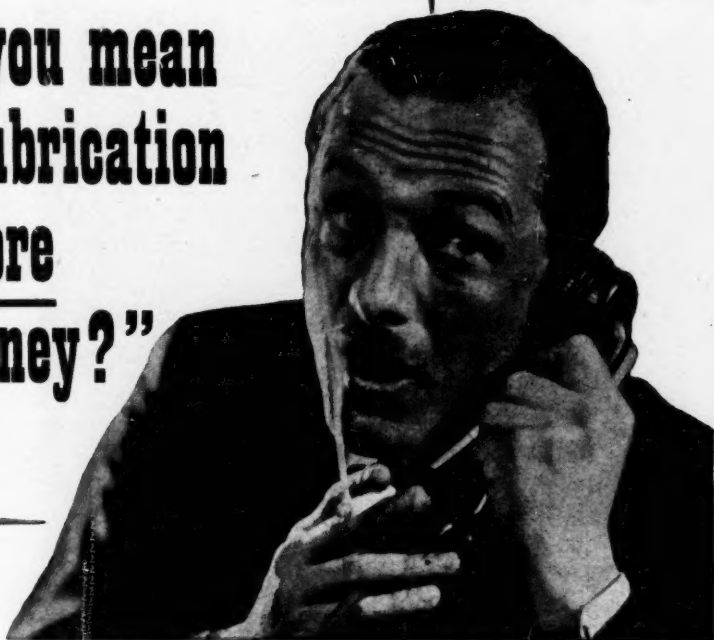
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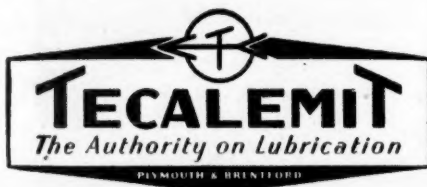
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The Mining Journal

Established 1835

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NOTES AND COMMENTS

How Free is the Tin Market to Be?

In the event the official announcement of the Churchill-Truman Materials Agreement has done little more than confirm what had already been unofficially reported from Washington.

So far as the section dealing with tin is concerned, the real difficulty is that so many questions still remain unanswered. No information has been given regarding how the British Government will be able to supply the U.S. with 20,000 tons of tin at £944 f.o.b. per ton. There have, of course, been a number of guesses; the most popular is that the U.K. will send over a part of its stockpile of tin. The size of this stockpile is unknown, but it would be surprising if it were to prove to be as much as the 10,000 tons suggested in some quarters. Even so, 10,000 tons will not go very far, except to tide over the immediate period.

In effect, such an arrangement would mean that the U.S. would keep its stockpile at its present level and that the U.K. would have to reduce its stocks. Whether such a robbing of Peter to pay Paul is justified—especially since Paul has been more than a trifle wilful—is open to doubt. Unless the U.K. Government has decided not to keep a stockpile in this country, consignments out of stocks will have to be replaced, and in any case the remainder of the 20,000 tons not sent from British stocks will have to be acquired—presumably in the open market. At present prices the Government stands to suffer a considerable loss on such purchases, although certain safeguards exist in the agreement which could result in Britain being partially reimbursed, in the event of the United States Government subsequently negotiating agreements elsewhere, at a price exceeding \$1.18.

A question which will interest the Americans is the date of commencement of deliveries. If the tin is sent from this country, it will arrive much sooner than it is delivered from Singapore. It will also be interesting to learn how deliveries are to be made—whether they are to be spread evenly over each quarter of the year, or whether the quota for the first quarter is to be supplied at once.

U.S. negotiations for further tin purchases are reported to be pending with Indonesia and Bolivia, but even assuming that Bolivia on any new contract were to supply as much as 15,000 to 20,000 tons of tin in concentrates this

year, it is clear that the United States will be still some way from covering their present restricted consumption requirements and a long way from covering their 1950 consumption of over 70,000 tons per annum. It is significant that the agreement with Britain only provides for 20,000 tons, whereas average annual U.S. imports of Malayan tin during 1949 and 1950 were in the neighbourhood of 44,000 tons. In the face of these figures it must be assumed that the Americans are still ready to accept the continuance of tin allocation, rather than buy in a free market.

Indeed, the whole tone of the Anglo-American agreement underlines what appears to be a loss of faith in the operation of the free market in the Land of Free Enterprise. It is a sad reflection that more than two years after the re-opening of the London Metal Exchange it should be found necessary for the official announcement to record that the two governments "agreed that it would be desirable, if more normal arrangements for the conduct of the tin trade could be established as soon as possible." Whether out of consideration for Mr. Symington's susceptibilities, or simply in an endeavour to buy tin below the world price, the United States is clearly endeavouring to by-pass the market and under cover of friendly governments, to come to terms with the producers one by one. Taken to their ultimate and logical conclusion, these tactics must lead to the suspension of the free tin market.

Nevertheless, whatever reservations there may be regarding the wisdom of the arrangements for supplying America with her tin, these must be viewed in the light of the undoubted and immediately beneficial effects of the injection of another 1,000,000 tons of steel into the British economy this year.

What Price Steel?

A new factor is now introduced into the calculations precedent to the revision of British steel prices. The advances authorized in August last were the steepest since the principle of price control was accepted, but inflationary influences have subsequently destroyed the economic balance of the steel industry.

It is true that a recent recession in ore freights has lightened to some extent the oppressive burden of transport charges on imported ores which reached fantastic heights

towards the end of last year. These, however, are still substantially higher than they were when steel prices were last reviewed and as producers' costs have been further swollen by wage advances, authorized increases in rail freight rates, and the price of coal and coke, which became operative on January 1, an application has, therefore, been submitted to the Minister of Supply for a reconsideration of the maximum permitted selling prices of iron and steel products.

The agreement concluded during Mr. Churchill's Washington visit for a shipment of American iron, steel and scrap to this country, introduces yet another inflationary element. Any subsidy from the Treasury may be ruled out as it would be entirely contrary to Mr. Butler's financial policy which is, of course, endorsed by the Cabinet.

The only question is how the additional cost of the American supplies is to be absorbed into the U.K. steel industry's price structure. There appear to be two alternatives, to spread the additional cost over the whole of the national steel output, or to limit its incidence to steel manufactured for home use. The growing competitive power of Germany and Japan may provide a powerful argument in favour of the latter course.

In any event, a transaction involving 1,400,000 net tons of steel or its equivalent in ore, scrap or pig iron at prices nearly 50 per cent above British levels, must constitute in itself a financial burden which, in some form, will have to be passed on to the consumer, and the sooner the necessary price adjustments are made the better.

Gold Coast Minerals Duty Bill

Although some months ago it was bruited about that the West African gold mining industry were seeking a revision of the sliding scale formulas which determines the level of the export duty paid by the individual companies, nothing more was heard on the subject until earlier this week.

On Tuesday last, particulars were released of a new Minerals Duty Bill, which will be introduced by the Minister of Finance to the next meeting of the Gold Coast Legislative Assembly. Although the Bill is expected to increase duties, payable by the mines, from £800,000 to £2,000,000 in a full year, the increased revenue expected by the Gold Coast Government will not come wholly from the gold mining industry. This is because of the new export duties on diamonds of 6½ per cent *ad valorem*, and the introduction of a duty on bauxite.

While the new rates are designed to increase substantially the amount of taxation paid by the mining industry, it is in line with the Government's former policy of assisting the lower grade mines. An explanatory note on the new Bill, states that the Gold Coast Government is appreciative of the rising costs which have to be met by the mining industry and, in particular, the difficulties that these increases make for the low grade mines. Much of the gold ore in the Gold Coast is of low-grade and the imposition on low grade mines of a higher duty would, by increasing production costs, render large blocks of ore unpayable.

The new duty will replace the existing varied duties on minerals which are: (1) on diamonds, an export duty of 6½ per cent, *ad valorem*; (2) on manganese, an export duty of 6s. per ton; (3) on gold, a duty expressed in shillings and pence per f.o.z., at rates which vary according to the ratio which the profits of each mine bear to its output. In addition, one gold mine pays to the Government a special royalty of 5 per cent of the value of its production. The new duty will also apply to bauxite, on which at present there is no duty.

The present bill proposes to apply the broad principles of the gold duty to all minerals. It will impose a duty on the value of minerals won at rates varying according to the

"yield ratio" of each mining undertaking.

The "yield ratio" is arrived at by taking from the value of the minerals all expenses necessary to the winning, transporting, processing and selling of the minerals, including allowances for depreciation and amortization. Thus, if during a year a mine produces £100,000 worth of minerals and its production and selling expenses amount to £70,000, its yield is £30,000 and its yield ratio 30 per cent.

The rates of duty are set out below and for comparison the effective rates are given of gold duty in 1948, when the Gold Duty Ordinance was enacted, and to-day.

| Ratio of profits to production | *Rates of proposed minerals duty | Rates of Gold Duty | | | |
|--------------------------------|----------------------------------|--------------------|------|--------------------|------|
| | | Per f.o.z. | | % of selling price | |
| % | % | s. | d. | 1948 | 1951 |
| 15 | Nil | 1 | 3.6 | 0.8 | 0.5 |
| 20 | 1 | 3 | 10.2 | 2.2 | 1.5 |
| 30 | 3 | 13 | 9.6 | 8.0 | 5.1 |
| 40 | 7 | 17 | 6.3 | 10.2 | 7.2 |
| 50 | 11 | 20 | 0.3 | 11.6 | 8.1 |
| 60 | 15 | 22 | 6.3 | 13.1 | 9.1 |
| 70 | 19 | 25 | 0.3 | 14.5 | 10.1 |
| 80 | 21 | 27 | 6.3 | 16.0 | 11.1 |

*With other rates interpolated.

The duty will not, however, apply to local African diamond miners who will, instead, continue to pay an *ad valorem* export duty.

Portugal

(From Our Own Correspondent)

Oporto, January 15

Of particular interest here is the resumption of shipments of low grade WO_3 and WO_3/Sn residues to the United Kingdom. Shipments were facilitated by an arrangement with the Customs, which only demanded the presentation of an assay certificate, before clearance, showing that the WO_3 content did not exceed 25 per cent. This facility was, however, somewhat tempered by the fact that the WO_3/Sn residues had to pay the same export tax of Escudos 16.00 per kilo, as the WO_3 residues. While it is felt that this imposition bore a little hard on exporters, many of them were of the opinion that they were fortunate in not being asked to also pay the export tax of Escudos 5.00 per kilo levied on cassiterite.

Export figures for wolfram concentrates in October and November of last year, together with the cumulative totals for the first eleven months of the year, are shown in the following table:

| Country | October (1951) (tonnes) | November (1951) (tonnes) | Jan.-Nov. (1951) (tonnes) |
|---------|-------------------------|--------------------------|---------------------------|
| U.K. | 51 | 228 | 1,988 |
| U.S.A. | 185 | 339 | 1,474 |
| Sweden | 6 | 26 | 73 |
| Belgium | Nil | Nil | 12 |
| Germany | Nil | Nil | 20 |
| Italy | Nil | Nil | 11 |
| Others | 10 | 20 | 35 |

In the following table, export figures are given for other Portuguese minerals in September and October of last year, together with the cumulative figures for the first eleven months.

| Material | October (1951) (tonnes) | November (1951) (tonnes) | Jan.-Nov. (1951) (tonnes) |
|----------------------|-------------------------|--------------------------|---------------------------|
| Tin Concentrates | 142 | 191 | 801 |
| White Arsenic | 39½ | 152½ | 654½ |
| Cupreous Pyrites | 48,291 | 28,621 | 489,215 |
| Manganese Oxide | 831 | 490 | 9,205 |
| Iron Ore (estimated) | — | — | 10,000 |

Airborne Magnetometers

Magnetic surveying, and the development and use of Airborne Magnetometers form the subject of the following article, which also gives some details of recent airborne ionization surveys to detect sources of gamma radiation.

In 1948, world expenditure on geophysics for mining purposes was estimated at \$2,000,000. Magnetic methods accounted for 48.7 per cent of this figure, and 29.7 per cent of the magnetic surveying was carried out by air. In 1950, the percentage of aerial work fell to 7.6 per cent, due to the completion of certain very large-scale surveys (E. A. Eckhardt, *Geophysics*, July, 1949 and July, 1951). Nevertheless, these figures are an impressive indication of the rapid headway made in the use of this new technique.

The various types of airborne magnetometers now on the market have been developed mainly in the United States and in Canada from a magnetic airborne detector (M.A.D.), devised by the U.S. Ordnance Laboratory in 1943 for the detection of submerged U-boats.

Magnetic surveying is, of course, a well established branch of geophysics. In ground surveying, however, attention is concentrated on one or other of the horizontal and vertical components of the earth's field and only a resolved part of the field is measured. Both these components would be difficult to measure from the air, because of the necessity for keeping the measuring instrument either vertical or horizontal. The procedure adopted, therefore, is to measure the magnitude of the total field, and this is done by a self-orientating device which ensures that the search coils of the magnetometer are always perpendicular to the direction of the total field.

The instrument consists basically of a flux gate comprising three coils at right angles to one another. If the recording coil is aligned exactly into the total field, the other two coils, being perpendicular to it, will record zero. If the recording coil wanders slightly, the two orientating coils take up the small components. A signal is then fed back through servo mechanisms which brings the recording coil back into the total field. Thus the recording coil is always so situated that the full intensity of the field is measured. This coil has a core of high permeability alloy.

METHOD OF EXAMINATION

The method of examination is to send round the recording coil circuit a sinusoidal voltage from a 1,000 c/s oscillator. If the magnetic field acting on the coil and its core changes in amplitude, the reactance of the coil system alters and distortion appears in the resultant wave form, a second harmonic being produced, which can be broadly described as proportional to the principal field. This second harmonic is therefore filtered off and, after passing through a number of electrical circuits, is used to actuate the pen of an electrical recorder.

At every variation of direction or altitude, the orientating coils come into play and the recording coil is readjusted into the total field. Any changes in the main field produce a varying amount of distortion which is transmitted to the pen mechanism. Thus the graph produced is a continuous record of the small local variations in the total field, which is fully compensated against errors which would arise if the recording coil wandered seriously.

One of the principal problems presented in the development of airborne magnetometers was to eliminate the effects of the plane itself on the detecting head. A plane gives off a large magnetic field of its own, the effects of which vary with changes of direction. In order to overcome this difficulty several methods of mounting the head have been tried. In some planes the head has been mounted as a projection to the tail, a position which, in general, is

sufficiently remote from the engines and other ferro-magnetic parts of the aircraft. Though slight magnetic effects are still experienced, they tend to be constant and can be compensated. In many aircraft of even medium size, however, the control equipment involves steel torque tubes which are so large that even at the extreme tail of the plane the magnetic effects are very great. Moreover, the shape of the disturbing field is too complex to permit satisfactory compensation of both permanent and induced moments.

The United States Navy solved the problem by towing the head in a bomb-shaped "bird" having sufficient tail surface to provide a high degree of weathercock stability. The cable is long enough to ensure that the head will not be affected by the plane's magnetic field. The recording unit and control box are located inside the aeroplane.

The control box is so designed that the sensitivity of the recorder can be adjusted, so that both very small and very large variations can be conveniently recorded. If the magnetic field is such that the record is liable to go off the paper, a shift can be put in to bring it back. The operator can also insert small blips at any desired time intervals.

USE OF AERIAL CAMERA

Having measured the magnetic field at any particular time, it is necessary to relate that time to a position, and thereby to relate the magnetic field to a position on the ground. If accurate airphoto maps of the area are available, this can readily be achieved by means of a suitable aerial camera synchronized with the magnetometer record. By careful comparison of the flight strips with the aerial map, the track of the aircraft and hence the location of the magnetic profile may be plotted with a high degree of accuracy. This method gives satisfactory results in countries such as Britain where good maps are available and there are recognizable features in small areas. Difficulties are presented, however, in remote areas and territories which are relatively featureless, and also if no air-photo maps are available. It is, of course, evident that some alternative method must be employed over water. Two methods, suitable for use in these conditions are Decca and Shoran, both of which enable the position of the plane at any given time to be effectively plotted.

The opinion has been expressed that the airborne magnetometer will probably always be supplemented by an aerial camera which is operated continuously when flying a profile. The film may be synchronized with the magnetometer record either directly or by suitably identifiable fiducials. The fiducials can be automatically injected at regular time intervals by the flight director. They appear in the magnetometer record as an instantaneous jag in the trace obtained by superimposing a fraction of a millivolt signal on the recorded quantity.

CONSIDERABLE INCREASE IN SPEED

The use of aircraft to carry magnetometers offers several important advantages over ground methods. The most spectacular benefit is, of course, the considerable increase in speed obtained with airborne instruments. Two American licensees of the Gulf Research & Development Co. completed about a £1,000,000 worth of contracts—mainly for oil companies—in 18 months, in the course of which at least 250,000 sq. miles were surveyed. The normal output obtainable with aircraft is reported to be 7,000 line miles per month, which is about 100 times that of a ground survey.

Another valuable gain is the elimination of ground interference. On the ground the record is confused by numerous small anomalies, such as bridges, railways, and other metal structures. Since a plane can carry the instrument at an altitude at which the effects of local disturbances are not experienced, the sensitivity and accuracy of detection are increased.

When surveying from the ground, observations must be made from several stations. With an airborne instrument a continuous profile is obtained and errors of interpolation are avoided. With automatic orientation and vector squaring, profiles which can be read to one gamma can be provided.

Airborne methods also enable the depth to the source of any anomaly encountered to be readily determined, since profiles can be flown at more than one altitude and the rate of decay of an anomaly is related to the depth at which it arises. Whereas many areas are difficult or impossible to cover by ground methods, no territory is inaccessible to an airborne magnetometer. Given reasonable areas, the cost should be about one-twentieth that of a ground survey.

WORLD-WIDE AEROMAGNETIC SURVEYS

The United States Geological Survey have several M.A.D. instruments and, by the end of 1947, had already surveyed over 180,000 sq. miles in the U.S.A. and in Alaska. The Geological Survey of Canada propose in time to survey the entire Dominion with airborne magnetometers. The Gulf Research and Development Co. have surveyed large areas in Canada with their own instrument, mainly for oil. In South Africa, an airborne magnetometer survey was carried out by Oscar Weiss's geophysical organization over the Vredefort area. Aerial methods are also being used in Australia.

The largest operation so far attempted over a predominantly marine area was the Bahamas airborne magnetometer survey. This was carried out under an agreement whereby five companies operated jointly as a single unit and contracted with the Aero Service Corporation of Philadelphia.

delphia. The original contract provided for at least 50,000 sq. miles to be surveyed, but the area covered was considerably greater. Other large jobs have been carried out in Venezuela, Columbia, Cuba and elsewhere.

It is on the American Continent that airborne magnetometers have been most extensively employed. It may be anticipated, however, that they will play an important part in developing the mineral resources of the Colonial Empire.

There is also a possibility that certain inductive electrical methods can be used in the air, but no information is available regarding any important developments in this direction. An attempt has been made, however, to carry out airborne ionization surveys for the purpose of finding sources of gamma radiation.

INVESTIGATING IONIZATION TECHNIQUES

To try out the possibilities of ionization techniques, a programme of work was undertaken in 1948-49 by the Geological Survey and Museum in collaboration with the Atomic Energy Research Establishment. The equipment comprised 49 Geiger tubes, together with quenching anti-coincidence and ratemeter circuits, a pen recorder and a power pack. An R.A.F. Anson aircraft was employed. Three natural sources of gamma radiation were used to obtain quantitative performance data.

From the information obtained it was concluded that the possibility of detecting a workable high-grade uranium lode in the course of a routine primary survey was extremely remote, and that the rapidity of cover obtainable did not compensate for inability to follow up the geological and mineralogical evidence.

The objections of relative insensitivity and high cost do not, however, apply to car-mounted Geiger equipment, for which the dirt roads of Africa are particularly suitable. In conjunction with A.E.R.E. a car-mounted Geiger-counter method has, therefore, been developed, and trials have already led to some new discoveries of radioactive minerals in the South of England. It is understood that the first overseas trials will soon take place.

AMERICAN COAL MINING INDUSTRY—IV

The Future of the American Coal Industry

In this concluding article, dealing with the future of the American coal industry, the team analyse the main forces compelling the U.S. coal industry to concern itself quite as much with what happens to the coal after it is won as with the task of its production. Thus the following article features trends in the utilization of coal and particular emphasis is placed on the production of synthetic fuel from coal—a development which, if successful, may regain for coal its former position as the prime source of energy in the United States.

The swing away from coal as a source of energy towards other forms of fuel in the period between the two world wars, if gradual, was persistent. In the five year period 1920-4 about 80 per cent of the total energy consumed in the United States was derived from coal and anthracite. But by 1947 this proportion had fallen to 50 per cent and by 1949 it had fallen to 40 per cent. Conversely, the combined contribution from petroleum products and natural gas during the two years 1947-49 rose from 46 to 55 per cent. More alarming to the coal industry, however, than the bare statistics was that coal as a fuel was being used less and less in its traditional markets—railways, electrical utilities and commercial and domestic heating.

Nor were the changes in the demand schedules of the nation hard to understand. Oil and natural gas have the advantages of flexibility and cleanliness; their energy is on tap and easily controlled; their transport is relatively simple and their handling easy.

Despite the growing preference for oil and gas, the coal mining industry, at first, did little to retain its markets. The generally held view in the industry was that it was

enough to produce the coal. What happened to it once it was sold was not their business. But the continued decline in demand for coal by its traditional markets soon roused the industry to its predicament. Accordingly, present policy is therefore directed on the one hand, towards producing the maximum amount of coal at the minimum price and, on the other, to investigating the uses to which the coal is put, the appliances in which it is used and the efficiency with which they are operated.

Though the team were not able to go deeply into the organization of research and development they were able to draw a good general picture of the research and development resources available and the trends in utilization.

The largest undertakings have their own research departments. In addition, about 300 companies contribute to Bituminous Coal Research Inc., a co-operative organization which also draws support from railway companies and from manufacturers both of mining equipment and coal-using appliances. The anthracite industry maintains, independently, a similar organization.

Universities in the mining areas and the great technical institutes such as Carnegie, Battelle and the Massachusetts Institute of Technology, undertake fundamental research into the constitution and properties of coal. Specific projects are sometimes financed or partly financed by individual companies or collectively by district associations.

In the fields of safety and mining practice, the U.S. Bureau of Mines performs a role similar to that carried out by the Ministry of Fuel and Lower's Research Establishment to which it acknowledges great indebtedness. The Bureau has special responsibilities, laid upon it by the Federal Government, for research into oil-from-coal processes. It also conducts other independent investigations into specific problems, maintaining, for example, a separate establishment for work on coal preparation. Furthermore, all the manufacturers of mining equipment have large development departments and collaboration between manufacturers, mining companies and research associations is close.

COAL UTILIZATION DEVELOPMENTS

In the field of utilization the industry is pressing ahead with developments that will mitigate some of the inherent disabilities of coal and increase the efficiency with which it is used. Joint studies are carried out to improve the performance of existing appliances; consumers and suppliers co-operate in research to design new ones and to determine the characteristics of the coal on which they will operate most efficiently.

Overfire jets have been developed which successfully eliminate smoke from industrial plant, railway locomotives and—a special application—river and lake steamers. Municipal action in creating smokeless zones has strong support from public opinion, and smokeless combustion is of great importance to the industry. So far the aim has been to achieve it in the design and modification of appliances rather than by modifying the fuel, and at present only one company makes a smokeless solid fuel. In the field of domestic appliances new models of closed stoves for household space-heating, burning bituminous coal smokelessly with up to 70 per cent efficiency, are under trial and were expected to be available for commercial production by the end of last year.

Coal and railway companies are carrying out joint investigations into the performance of locomotives, experimenting with various types and sizes of coal and with modifications to grates and combustion arrangements. Fuel costs have been reduced by 20 per cent by the use of specially prepared coals and further improvements are confidently expected. Considerable joint effort is being put into the development of the coal-fired gas turbine and a prototype railway locomotive was expected to be ready for testing before the end of 1951. Engineers are confident that it will enable coal to compete effectively with Diesel oil, to which many railways have swung over in recent years.

SYNTHETIC FUELS FROM COAL

Yet it is in the field of synthetic fuels that coal may regain its former position as the most important source of energy. Nor is this merely another aspect of developing fresh outlets for conventional products. For even if estimated coal reserves are deflated by half and reserves of oil and natural gas are reckoned at double their present volume, coal will still remain by far the largest source of mineral fuel in the United States. For this reason the U.S. Bureau of Mines is carrying out laboratory and large-scale pilot-plant work on the production of synthetic fuels.

The team visited the experimental station at Bruceton, Pennsylvania, where the U.S. Bureau of Mines is working

on two oil-from-coal processes of German origin:

(a) The gas synthesis or indirect Fischer-Tropsch process of first gasifying the coal and then converting the resultant synthesis gas, a mixture of carbon monoxide and hydrogen, to liquid fuels;

(b) The direct hydrogenation or Bergius process.

Its approach is to regard these as complementary rather than competitive processes—the liquid products that each is best adapted to produce differ, varying from heavy fuels, which are essentially little different from liquid coals, to aviation petrol.

Additionally, large-scale pilot-plant experiments are being carried out in Missouri and in March of last year a 200-barrels-a-day hydrogenation unit was operating and a 50-barrels-a-day synthesis gas plant was nearing completion. Production from these plants will be adequate for working out methods of recovering and refining chemical by-products. Neither process is yet economic; but the team understood that the cost of production at the present low selling price of coal has been brought down to within a few cents of the selling price of conventional spirits. Indeed, only a slight variation of costs (downward in these processes or upward in the oil industry) or a greater national urgency is needed to make oil-from-coal a commercial proposition. The coal industry which in recent years has lost ground heavily in the railway market, may well regain it by the establishment of processes for the conversion of coal to diesel fuel.

SIZE OF COAL IMMATERIAL

The most significant feature of these developments is that one or other of the processes can make use of all ranks and types of coal. Even more important from the mining engineer's standpoint is that their successful development means that the size of the coal is immaterial as the plants will operate on fines. This, of course, is of particular importance to the greater development of continuous mining. For if still greater degradation is acceptable, underground techniques and the design of underground machinery may alter considerably. In the long run coal will be regarded as an ore. Revolutionary mining methods and machines will chew it off the face, deliver it to the transport system and so to the surface plant in a continuous integrated operation. On the surface it will be converted into a fuel.

Side by side with the foregoing, the U.S. Bureau of Mines is carrying out an extensive research and development programme on the production of synthesis gas and on the complete gasification of lignite and sub-bituminous coal. Several of the larger companies are doing similar work independently. Similar work is being carried out in the field of carbonization with a view not only to the improvement of metallurgical coke and the development of carbonized "premium" fuels, but to the more efficient extraction and utilization of the derivatives.

U.K. SHOULD DEVELOP REVOLUTIONARY MEANS

Despite the differences of the scale on which the U.S. and British industries operate, the team believes that the ultimate problem facing both countries is similar. In place of competition from oil and gas, the British industry has to compete with the problem of supplying constantly increasing demands for energy from steadily deteriorating reserves. As previously stated by the team in its report, the British industry cannot hope to match American performance in conventional terms of productivity. But there are no technical obstacles in the way of this country outstripping the American industry in terms of the amount of use which is made of the coal that is raised. Therefore, the team recommends that a determined effort should be made to develop revolutionary means, adapted to British conditions, of getting the coal cheaply to the surface where its vast potential can be profitably exploited.

Kyanite in Central Africa

The following paper entitled "Kyanite in Central Kenya, Angola, and Bechuanaland," by Mr. W. E. Sinclair, of Johannesburg, is reproduced from the January, 1952, issue of the *Bulletin of the Institution of Mining and Metallurgy*

Kyanite is one of the group andalusite-sillimanite-kyanite, comprising minerals with the composition Al_2SiO_5 , but with differing physical properties. All are widely distributed in the earth's crust, but are rarely aggregated into workable deposits. Their value depends on whether they are able to provide suitable raw material for making high-grade refractories, such as are necessary for electric furnaces, sparking plugs and the like. In the process of manufacture these minerals, by being heated in kilns at temperatures from 1,200° to 1,400° C. are inverted to the refractory mullite ($3Al_2O_3 \cdot 2SiO_2$) and free silica. Kyanite, which usually occurs in bluish blade-like crystals, is more amenable to heat processing than the other two minerals. All occur in certain metamorphosed rocks grouped as schists and gneisses, but of widely different mineral constitution.

IMPORTANCE OF KENYA OUTPUT

Before the development of the Kenya kyanite deposits, the only important supplies of the high-alumina refractories came from the U.S.A. and India. In latter years, output from India has dwindled considerably. The steadily mounting output from Kenya now constitutes a substantial contribution to world supplies, quite apart from the value of these exports to the Colony's economy.

The main source of the Kenya supply is from Murka Hill, about 12 miles from Taveta. The kyanite occurs in shear zones in the gneisses of the Basement System and the deposit is characterized by the not uncommon feature of an extensive bouldery talus around its base. Some of these boulders, weighing hundreds of tons, are made up of high-grade kyanite, frequently containing over 95 per cent of silicate of alumina.

The deposit is lenticular in form with a main core of high-grade material consisting of aggregates of deep blue, thin-bladed, triclinic crystals scattered through the biotite schists and gneisses. Pegmatite and quartz veins penetrate the main body, mostly on the underside where it seems to dip at 45° in a northerly direction.

At the western end of Murka Hill, an extension of the deposit is being opened up in flat country, where only a few boulder-like outcrops indicated its presence. This extension differs from the main body in that the kyanite-bearing rock contains varying quantities of free corundum, which probably accounts for its greater hardness. The Indian kyanite also contains free corundum, but is generally quite different physically from the Kenya kyanite, the latter having a much coarser crystalline structure, which makes inversion to mullite more difficult and also creates a weak mechanical structure on firing.

PROCESSING KYANITE ROCK AT MURKA HILL

At Murka Hill the kyanite rock is broken down with the aid of compressed-air machines in open quarries and, after preliminary sorting to remove obvious waste, is delivered to the crushing and sorting plant, where the gangue (mainly quartz) is removed and the kyanite classified into two grades. The low-grade material is stacked for beneficiation treatment later. The existing plant treats the high-grade kyanite, which, after secondary crushing and screening, is delivered to rotary kilns for inversion to mullite. The latter product is then cooled and screened for grading and shipment.

An auxiliary plant to treat low-grade ore by means of jigs and flotation methods is nearing completion. When it is in operation, there should be a substantial increase in production.

KYANITE IN ANGOLA

In September, 1950, it was recorded in *Bull. Instn. Min. Metall.* No. 526, September, 1950, p. A75, that there had been a discovery of kyanite in Angola, the report coming from an American source. It was stated that a survey indicated a minimum of 5,000-6,000 tons of mineral, based on outcrop indications. Transport difficulties may possibly deter development of the deposit. No reference was made to the quality of the kyanite or to whether tests of any kind have been carried out on it.

Soon after the above announcement came news that a kyanite deposit had been discovered in Bechuanaland, about six miles from Francistown. An examination of this occurrence by the author revealed a hill deposit containing about 20,000 tons of kyanite on the surface. About a third of this tonnage consists of high-grade kyanite of a quality somewhat resembling the Indian material, although no free corundum is present.

The rest of the deposit exposed at the surface is made up of low-grade material, but despite this fact, it seems that the deposit is worthy of further investigation, especially as to the possible existence of a larger body underground.

If a large tonnage were found, the proximity of the deposit to the railway and local markets would be a favourable factor.

Sweden's Uranium Deposits to be Surveyed

Sweden's uranium deposits are to be surveyed by groups of experts who are now at work in various parts of the country. If the deposits are found suitable for the extraction of uranium, they may form the foundation for a future Swedish production of atomic energy.

Exhaustive research and experimental work in the field of atomic energy have been carried on in Sweden since 1946, when the Atomic Energy Committee was formed. All this work is being done in close collaboration between the Government, industry, five different University organizations, and the Research Institute for Experimental Physics in Stockholm.

Sweden's first reactor, a 100 kW. unit, it at present being built near Stockholm, blasted into the solid rock, and is expected to be operating in 1953. The reactor will be of great value for continued experiments and for the production of isotopes, which have hitherto been imported from the United States and from Great Britain.

As far as other equipment is concerned, Sweden's third cyclotron, with a capacity of 25,000,000 electron volts, was completed last summer at the Institute for Experimental Physics, while a synchro-cyclotron of 200,000,000 electron volts is nearing completion in Upsala at the Institution for Nuclear Research conducted by the Nobel Prizewinner Professor The Svedberg. In addition to these, Sweden has a number of van der Graaf generators, of which the two largest, now building in Lund and Gothenburg, will have a capacity of 3-4,000,000 volts.

TECHNICAL BRIEFS

British Team to Study U.S. Fuel Saving Methods

Another British team is to travel to the U.S. at the end of this month under the auspices of the Anglo-American Council of Productivity to study U.S. fuel conservation methods. Power installations in a variety of industries will be investigated and conferences will be held with the U.S. associations dealing with coal, gas and oil. However, furnace industries and those depending largely on coal as a raw material are excluded from the enquiry. Eventually, the team will make recommendations for economizing in existing resources and for a long-term British policy for using fuel.

A New Use for Gold

Certain gold-beryllium alloys are corrosion resistant and are extremely suitable for use in neutron reactors. A patent claiming the preparation of such alloys has been claimed by H. Hirsch and M. Kowalchik in conjunction with the Atomic Energy Commission (U.S.P. 2,556,921). A suitable alloy for the purpose contains 8.45 per cent beryllium and 91.55 per cent gold. Beryllium and gold powders are intimately mixed in these proportions and compacted in a die which is heated to 350° C. for one hour. It is compressed for five minutes at a pressure of not less than 50 tons per sq. in. The resulting alloy, which has a density of 10.6 and a hardness of 95 on the Rockwell "B" scale, may be readily plated with gold or nickel.

Ferrosilicon Versus Galena at Mascot

The American Zinc Co. has, for ten years, operated their heavy medium plant at Mascot with galena. During this period, nearly 10,000,000 tons of ore have been treated, the ore consisting of lead-free sphalerite in dolomitic limestone, together with some chert and pyrite. In 1948, because of the increasing cost of galena, it was decided to change the plant over to ferrosilicon operation. The results since then have proved extremely encouraging. The separation costs have been reduced by 12.09c. per ton and the tonnage rate has been increased. In addition, the recovery has been improved, using a simple circuit which has proved to be very satisfactory under all feed conditions. (*Trans. Am. Inst. Min. Met. Eng., Tech. Publ. No. 3112B*).

International Coal Classification

Scientists from Great Britain, the U.S. and European countries have been trying to work out an international system for the classification of coal, based on its calorific value, volatile matter and caking properties in order to guide a buyer or user in finding the best coal for any given purpose; in addition, it will be advantageous to have a universal language in coal classification.

In their meetings at Geneva (held under the auspices of the Coal Committee of the Economic Commission for Europe) scientists have found difficulty in agreeing on a suitable test for measuring the caking properties of coal. British, French and Belgian scientists recently visited Holland to study the tests used there and a British method of assessing caking properties—the Gray King assay coke test—is now being studied by Dutch and French scientists at the National Coal Board's Coal Survey Laboratory at Sheffield. These exchanges of views and scientific information are proving to be very valuable and it is confidently expected that an agreed international classification will be worked out.

Bacterial Casing Corrosion

An article on the possible importance of bacterial corrosion of iron and steel to the mining profession appeared in *The Mining Journal*, May 5, 1951. Recently, an interesting example of this type of corrosion has been reported by Doig and Wachter (*Corrosion*, 7, 212, 1950). In the Ventura field, considerable trouble was experienced with casing corrosion. Extensive efforts made to ascertain the cause of this met with no success and no satisfactory preventive could be found. Ultimately, an examination of recovered casing showed the presence of anaerobic sulphate-reducing bacteria and these bacteria were responsible for the corrosion. The use of a highly alkaline drilling mud inactivates the bacteria and all the Shell wells in the Ventura field are now employing such a mud.

Hydrochemical and Temperature Characteristics in the Detection of Petroleum

According to Sukharev (*Doklady, Akad. Nauk S.S.S.R.* 77, 645, 1951), the examination of subterranean waters gives valuable information as to the probability of the presence of petroleum deposits. In the vicinity of petroleum deposits such waters show a temperature below normal and the presence of hydrocarbons above methane is also a favourable sign. If the temperature is above 70°C. the presence of naphthenic acids and trace elements such as iodine or bromine is a good indication. If the temperature is below 70°C. then sulphate reducing bacteria will probably be active. If, therefore, there is a high ratio of the difference between sodium and chloride concentration to sulphate concentration together with, possibly, the traces of naphthenic acids, iodine and bromine, then it is highly probable that petroleum deposits are present.

U.S. Work on Electric Ore-to-Steel Furnaces

Electric furnaces able to turn ore directly into steel are within the realm of possibility: this statement was made by Mr. Newhall, sales manager of the smelting division of the Pittsburgh Lehigh Furnace Corporation, who foresaw the possibility of an ore-to-steel electric furnace in connection with an announcement that his company had received an order from South America for two electric smelting furnaces that turn ore directly into pig-iron.

According to a report from New York, the capacity of the 18,750 kv ore-to-iron furnaces would be 200 tons daily. Their design differed from conventional electric furnaces in that six carbon electrodes were arranged in a line, permitting the electrodes to be spaced to meet different ore conditions. This type of furnace layout had, he said, been used successfully in smelters for nickel, copper and titanium ores. Mr. Newhall added that ore-to-iron furnaces were developed for use in some parts of Europe because coke was scarce and expensive there and electricity costs were relatively cheap. The record of service of the furnaces could not be ignored and he considered that the U.S. steel industry should develop further the ore-to-iron furnaces and thus eliminate reliance on fluctuating supplies of steel scrap.

However, it was commented in other U.S. steel quarters that a considerable amount of further research and development work would be required before the final aim of an ore-to-steel furnace could be attained.

METALS, MINERALS AND ALLOYS

The official communiqué regarding the results of the Churchill-Truman talks has centred discussion on the new technique of obtaining tin. The implications of this are discussed under "Notes and Comments."

The United Nations have also made a contribution to the same subject by issuing a report entitled *Measures for International Economic Stability*. The report has not yet reached this country, but dispatches from the U.S. state that the five joint authors do not admit that the price mechanism is ideal, but they "see no prospect that a system of direct international intervention to fix long-term price relationships would achieve results nearer the ideal, even assuming that such an ideal could be internationally defined." On the question of short-term fluctuations, the authors can visualize no other method of reducing the impact other than international commodity agreements. It will be interesting to see, when this report is eventually available here, if the authors really believe that the best way to attain stability is to negotiate a number of short-term agreements.

Mr. Charles E. Wilson, director of U.S. Defence Mobilization, recently made the significant statement that "the peak of the steel shortage has passed." The most critical shortages are now seen to be copper and aluminium, which in some instances may actually act as a brake on steel consumption.

COPPER.—Although Mr. Sawyer, Secretary of Commerce in the U.S., is opposed to the idea of the U.S. buying metals overseas at higher prices, a contract between the Government and Calumet and Hecla Consolidated Copper, provides for a price to be paid above the normal ceiling. This company has four high-cost mines which are being crippled by price controls. The offer of a higher price for copper will enable these mines to keep in production and add, over the next year or eighteen months, 500 s.tons of copper per month to the U.S. supplies. Although the new arrangement will not add to the present output, it will stop the closing down of the mines and the consequent loss of 6,000-9,000 s.tons of copper. This contract will probably form the basis for further contracts.

Following the conclusion of the Churchill-Truman talks on raw materials, suggestions have been made that the U.S. will later receive additional supplies of Canadian copper. The amount is stated to be in the region of 60,000 to 75,000 tons a year.

The Chilean Under-Secretary for Foreign Affairs has denied that his country is asking the U.S. for a higher price for copper.

Yugoslavia's copper output in 1951 is officially estimated at 14,000 tons. This is equivalent to about one-third of pre-war production.

LEAD.—The lead position has not changed very much during the past week; the price of Mexican lead f.o.b. Monterey declined last week to 19.45c. per lb. against 19.80c. a week earlier. After a lapse of three months Australian, Yugoslavian, Peruvian and some Mexican sellers are reported to have resumed offerings to the States at the U.S. ceiling price.

U.K. consumers are well supplied and with the price tending to ease show no eagerness to buy.

Imports of refined lead into the U.S. during the first eleven months of 1951 was only 163,369 tons against 391,467 tons in the corresponding period of 1950. A large part of this decline was the result of imports from Mexico dropping from 196,852 to 33,960 tons.

TIN.—As a consequence of the U.K.-U.S. agreement on raw materials, the R.F.C. is raising the price of tin from \$1.03 to \$1.21½ per lb. This official recognition that the prices of \$1.03 or \$1.12 are unrealistic, is leading American opinion towards the idea that talks with Bolivia will re-open shortly. The Indonesian tin mission is not now expected in Washington before January 31.

Talks with the Indonesian Tin Mission are expected to start in Washington in the near future. Upon the successful and speedy conclusion to these negotiations depends the continuance of operations at the Longhorn smelter next May. The general manager is quoted as saying that unless tin concentrates are

available by the end of February, production will cease on May 1. At present only four out of the nine furnaces are working, and as a consequence the normal monthly output of 3,000 tons has been reduced to between 1,700 and 1,800 tons per month.

ZINC.—Little noteworthy news has come in concerning this metal. The U.S. price has eased further; prime western zinc, export f.a.s., has been quoted as low as 22-23c. per lb. but later firmed to 23c. The American Iron and Steel Institute announces that the shipments of galvanized sheets in November dropped to 143,044 tons, the lowest level for two years. Total shipments in the first eleven months of 1951 totalled 1,839,890 tons as compared with 2,088,152 tons.

ANTIMONY.—Although producers of antimony ores in the U.S. are confident that they will be able to command the full ceiling price, they also entertain the belief that they will be able to accept export orders later this year.

MANGANESE.—An ore bed of manganese has been discovered in the Upper Nile Province of the Sudan. The extent of the bed is not yet known, but at the point of intersection it was 12 ft. thick. The bed is reported to contain a high percentage of manganese.

According to the International Materials Conference, manganese was not likely to require to be placed on an allocation basis during 1952.

The Government of Jamaica has been asked for a 25-year lease to mine manganese over eight square miles in Portland on the north of the island.

TUNGSTEN.—The U.K. wolfram price remains at 485s. c.i.f. The Ministry have ceased buying for the time being and consumers in this country having covered their immediate requirements are out of the market. Business is also restricted on the Continent.

Assistance is to be given by the Export-Import Bank to the Aramayo Mines in Bolivia. The company is spending large sums of its own money in developing the extensive ore reserves, and the Bank is to help by lending \$580,000. Shipments of ore from the increased production are soon to be made to the U.S. Emergency Procurement Service.

Portugal has increased its exports of wolfram ore by 28 per cent during the first eleven months of 1951; the U.S. took 1,474 tons in the period, whereas it bought none in the corresponding months of 1950.

SILVER.—India's silver refinery, the first in Asia, will go into production late in 1953, according to a Bombay report. The officer in charge of the project will shortly tour Europe to purchase machinery for the £450,000 project. The refinery, on which work is due to start in the spring, will be built at Alipore in the suburbs of Calcutta. When completed, it will undertake extraction work for Burma and China and may affect the flow of Indian silver to refineries in Germany, the U.K. and the U.S.

The London Metal Market

(From Our Metal Exchange Correspondent)

As the official announcement covering the U.K./U.S. agreement on steel, aluminium and tin confirmed the earlier reports, the markets both in London and the East have maintained their firmer tendency, but it is not expected that there will be any rapid upswing in prices in the immediate future. It is to be assumed that the next price level will depend upon the outcome of America's negotiations to purchase further tonnages of tin as the price of 118c. per lb. f.o.b., which figures in the agreement, is subject to upward adjustment should a higher price be paid for any other long term commitment to a producing country, and in passing it is interesting to note that the basis for determining whether a higher price has been paid is to be the weighed up price New York, which may enable an apparently higher price to be paid to the Bolivians without

any corresponding adjustment in the price of the British contract.

The future general trend of the market must be influenced to a large extent by whether the U.S. Government is going to buy sufficient tin to enable it to relax some of the end use restrictions, thus allowing the total consumption to increase. This fact is very important as the latest estimate of a surplus of 20,000 tons of tin during 1952 is based on an estimated American consumption of 60/65,000 tons, and it is only if this figure is exceeded will the prospective surplus of metal be diminished. If the political aspects of the situation continue to limit American consumption to the estimated figure, their requirements will probably be met by the 20,000 tons bought from Malaya, plus a new ore contract with the Bolivians to enable the Texas smelter to continue operations, plus a balance from Indonesia and elsewhere which will probably amount to 10/15,000 tons.

On the 22nd the R.F.C. increased its selling price, which had been maintained at 103c. per lb. since August 2, 1951, to 121½c. per lb., which is the equivalent of the price in the British contract plus charges, and the opportunity to raise the price must have been eagerly seized by the R.F.C. officials as their sales of tin over the last few months must have been made at a loss.

On Thursday the official close on the tin market was: Settlement price £990, Cash Buyers £989 10s., Sellers £990, Three months' Buyers £986, Sellers £987 10s. In the afternoon the market was strong. Turnover for the day was 345 tons. Approximate turnover for the week was 1,075 tons.

The Eastern price on Thursday morning was equivalent to £984 10s. per ton, c.i.f. Europe.

Iron and Steel

When Parliament re-assembles next week, the Bill to denationalize the steel industry will be one of the first items in the programme of legislation. A complete restoration of the status quo is not contemplated. The Government is credited with the intention to seek the appointment of a board of control with supervisory authority over the steel industry in the national interest. The composition of this board is expected to include representatives of the Government and of steel consumers, as well as the managements and the workers.

At the moment, however, chief interest is focused upon the efforts which are being made to manage the supplies of steel available for British industry, by the expansion of home production and the acceleration of imports.

The Government appears to be tackling these problems with vigour and determination, and there is now a growing belief that the crisis may be speedily overcome.

The promise of over 1,000,000 tons of American steel this year, or its equivalent in pig iron, scrap and ore, will reduce the deficiency in home supplies to manageable proportions: B.I. & S.F. has sent a deputation to Tokyo in the hope of purchasing 200,000 tons of steel from Japan, and French and Belgian producers are very pressed to accelerate deliveries.

It is recognized that these imports will be very expensive and since the Government is resolutely opposed to subsidies, the additional cost may be passed on to U.K. consumers. Thus a steep rise in British steel prices is expected in the near future. Costs of production have risen because of the higher prices of coal and fuel oil, the advance in rail freights, and cost of living wage increases to the workers.

These, in sum, amount to a very considerable burden and the consequential rise in prices is bound to be steep. Compared with the disastrous consequences of a steel famine, however, it is the less of two evils, and most consumers are now resigned to the prospect of controlled inflation, though they are hoping that present doubts and uncertainties will be dispelled by an early decision.

Meanwhile, the steel development plan goes forward as an essential item of reported development. Capacity is steadily increasing and if the supply of raw materials can be increased, there will be no difficulty in achieving a rapid expansion of production. The first step is to increase coke oven and blast furnace capacity, and this, it is believed, will be more readily accomplished than the planned increase in the supplies of home scrap. An immense amount of effort has been expended upon scrap recovery, but the results have not thus far been very encouraging.

JANUARY 24 PRICES

COPPER

Electrolytic £227 0 0 d/d

TIN

(See our London Metal Exchange report for Thursday's prices)

LEAD

Soft foreign, duty paid £175 0 0 d/d
Soft empire, including secondary lead £175 0 0 d/d
English lead £176 10 0 d/d

ZINC

G.O.B. spelter, foreign, duty paid £190 0 0 d/d
G.O.B. spelter, domestic £190 0 0 d/d
Electrolytic and refined zinc £194 0 0 d/d

ANTIMONY

English (99%) delivered,
10 cwt. and over £365 per ton
Crude (70%) £290 per ton
Ore (60% basis) 45/50s. nom. per unit, c.i.f.

NICKEL

99.5% (home trade) £454 per ton

OTHER METALS

Aluminium, £148 per ton.
Bismuth, 28s. lb.
Cadmium, 18s. 9d. lb.
Chromium, 6s. 3d. lb.
Cobalt, 20s. lb.
Gold, 248s. f.o.z.
Iridium, £65 oz. nom.
Magnesium, 1s. 6d. - 2s. lb.
according to quantity.
Osmiridium, £35 oz. nom.
Osmium, £70 oz. nom.
Palladium, £8 10s. oz.
Platinum (scrap), £33.
Platinum, £27/33 5s. nom.
Rhodium, £45 oz.
Ruthenium, £30 oz.
Quicksilver, £73 10s./£74
ex-warehouse.
Selenium, 25s. nom. per lb.
Silver (bar), 77d. f.o.z. spot
and forward.
Tellurium, 19s. lb.

ORES, ALLOYS, ETC.

Bismuth 50% 16s. lb. c.i.f.
40% 14s. 9d. lb. c.i.f.
Chrome Ore—
Rhodesian Metallurgical (lumpy) £13 per ton c.i.f.
" " (concentrates) £13 per ton c.i.f.
" " Refractory £12 12s. per ton c.i.f.
Baluchistan Metallurgical £13 18s. 6d. per ton c.i.f.
Magnesite, ground calcined £26 - £27 d/d
Magnesite, Raw £10 - £11 d/d
Molybdenite (85% basis) 103s. 1½d. per unit c.i.f.
Wolfram (65%), U.K. 485s. nom. c.i.f.
Tungsten Metal Powder 35s. nom. per lb. (home)
(for steel manufacture)
Ferro-tungsten 33s. nom. per lb. (home)
Carbide, 4-cwt. lots £30 3s. 9d. d/d per ton
Ferro-manganese, home £41 8s. 2d. per ton
Brass Wire 2s. 7½d. per lb. basis.
Brass Tubes, solid drawn 2s. 1d. per lb. basis.

U.K. METAL & MINERAL IMPORTS

| | Units | Dec. 1951 | Jan.-Dec. 1950 | Jan.-Dec. 1951 | Increase or Decrease in 1951 over 1950 |
|---|-------|-----------|----------------|----------------|--|
| Non-ferrous metals and manufactures: | | | | | |
| Aluminium and alloys... | Cwt. | 216,017 | 2,824,175 | 3,548,605 | +724,430 |
| Bismuth* | Lb. | 76,744 | 378,879 | 557,375 | +178,496 |
| Cadmium | Lb. | 145,302 | 1,073,454 | 1,492,129 | +418,675 |
| Cobalt and alloys | Lb. | 505,686 | 4,026,667 | 3,479,767 | -546,900 |
| Copper: | | | | | |
| Electrolytic | Tons | 17,063 | 209,858 | 219,181 | +9,323 |
| Other | Tons | 12,810 | 107,514 | 136,470 | +28,956 |
| Lead | Tons | 27,143 | 171,886 | 174,823 | +2,937 |
| Mercury | Lb. | 107,637 | 4,119,097 | 1,427,304 | -2,691,793 |
| Nickel | Cwt. | 19,546 | 74,748 | 112,344 | +37,596 |
| Tin | Tons | 1,613 | 4,600 | 10,912 | +6,312 |
| Zinc | Tons | 16,851 | 141,918 | 119,761 | -22,157 |
| Ores and concentrates: | | | | | |
| Antimony ore and conc. | Tons | 2,847 | 14,372 | 26,415 | +12,043 |
| Bauxite | Tons | 27,136 | 198,752 | 343,701 | +144,949 |
| Chromium ore | Tons | 7,459 | 105,879 | 132,287 | +26,408 |
| Iron pyrites† | Tons | 35,677 | 191,636 | 347,558 | +155,922 |
| Manganese ore | Tons | 35,320 | 402,825 | 386,085 | -16,740 |
| Molybdenum ore | Cwt. | 10,814 | 61,716 | 62,458 | +742 |
| Nickel ore, conc. & matte | Tons | 2,665 | 25,221 | 35,354 | +10,133 |
| Tin ore and conc. | Tons | 5,336 | 46,130 | 50,773 | +4,643 |
| Titanium: | | | | | |
| Ilmenite | Tons | 500 | 94,652 | 78,255 | -16,397 |
| Other sorts | Tons | 582 | 6,780 | 9,411 | +2,631 |
| Tungsten ore | Tons | 637 | 5,831 | 4,760 | -1,071 |
| Zinc ore and conc. | Tons | 16,857 | 197,494 | 180,533 | -16,961 |
| Non-metalliferous mining products: | | | | | |
| Asbestos | Tons | 12,396 | 109,904 | 122,392 | +12,488 |
| Magnesite | Tons | 2,267 | 21,648 | 22,969 | +1,321 |
| Sulphur | Tons | 19,125 | 439,273 | 380,423 | -58,850 |

*Excluding bismuth alloys.

†Including cuprous iron pyrites.

COMPANY NEWS AND VIEWS

Virginia Gold Financing

The Kennecott Copper Corporation is to provide a further £3,000,000 for the Virginia Orange Free State Gold Mining Co. The new funds are required primarily to advance the date of production and to double the initial milling capacity planned so that the initial milling capacity will, therefore, now be 50,000 tons a month.

In terms of a provisional agreement, Kennecott Copper Corporation has agreed to subscribe firm for cash, at par, for £2,000,000 of Unsecured, Registered Loan Stock and, subject to certain conditions, have further agreed to subscribe on the same terms, for a further £1,000,000 loan stock, between October 31, 1952, and February 28, 1953, if called upon to do so by Virginia O.F.S.

The loan stock will bear interest at 3 per cent, as from the date when milling commences and will be convertible as to 35 per cent into 5s. shares at 17s. 6d. per share, up to the end of 1954. Redemption will not begin until after the existing debenture stock has been paid in full, subject to final payment being not later than June 30, 1967. The loan stock will not be offered to ordinary stockholders.

In order to provide the shares required to meet the conversion rights, as and when exercised by the holders of the loan stock, it is proposed to increase the company's capital from £2,562,500 to £2,862,500, by the creation of 1,200,000 new 5s. shares. Additionally, the directors are also seeking authorization to increase their borrowing powers to £4,000,000 over and above the £2,000,000 already borrowed and represented by the debenture stock.

These proposals will be submitted to shareholders at an extra-ordinary meeting called for February 19, in Johannesburg.

Zams. Pays 20 Per Cent.—The Zambesi Exploring Co. have proposed a final dividend of 6 per cent and a bonus of 10 per cent, making twenty per cent for the calendar year 1951 on its issued capital of £865,333. This distribution compares with a total of 13 per cent paid in 1950, consisting of an interim dividend of 3 per cent, a final dividend of 5 per cent and a bonus of 5 per cent.

Profit for the year, subject to audit, and before tax, was £166,609 against £82,033. Last year's profit figure, however, was struck after charging £86,475 loss on the sale of shares to Tanganyika Holdings. Income tax shot up from £3,500 to £75,000 leaving a net profit, after all charges, of £91,609 against £78,533 to which was added £13,540 (nil), credit in respect of an amount previously written off.

The preliminary statement announcing these results also reported that the losses brought forward for income tax purposes were used up in the year ended December 31, 1950. Losses brought forward for profits tax purposes have been sufficient to extinguish any liability in the accounts of the company for the year ended December 31, 1951, but these losses are now used up.

The total distribution of 20 per cent required £90,860 compared with 13 per cent and £61,871 in the previous year, leaving the forward balance higher at £96,220 against £81,931 brought in.

The accounts of the wholly owned subsidiary, the Zambesi Investment Co., which was formed by Zams to take over its shareholdings in Tanganyika Concessions after "Tanks" reorganized its capital structure, prior to its emigration to Southern Rhodesia, have not been consolidated with the parent company. The results—which are shown separately—record a profit, after providing £26,228 for taxation, of £24,043, which was carried forward.

Sir James U. F. C. Alexander is chairman. The annual meeting will be held in London on April 2.

"Johannes" Application to Emigrate Pending.—The directors of Johannesburg Consolidated Investment have announced that application was made to H.M. Treasury under Section 36 of the Finance Act, 1951, some time ago to transfer the central management and control of the company from the United Kingdom to South Africa.

The application, the directors added, is still pending and a further announcement will be made in due course.

New Modder Gold: Reduction of Capital.—A further reduction by 6d. per share in the capital of New Modderfontein Gold Mining has now been confirmed by an order of the South African Supreme Court and will be registered on January 31.

The repayment of 6d. per share will be made to shareholders registered at the close of business on January 31 and cheques in payment will be posted on or about February 27.

Bangrin's No. 3 Dredge Laid Up.—Bangrin Tin Dredging have announced that the bottom plates of the Pontoon of the No. 3 dredge are due for renewal this year and that the dredge is expected to clock when the necessary steel plate arrives. The dredge will be out of commission for approximately three months.

Recent Borehole Results.—General Exploration Orange Free State ("Geoffries") have announced the following results obtained in borehole Spes Bona 2, on Farm Spes Bona 921, in the Odendaalsrus district of the Orange Free State. From a depth of 6,763 ft. 6 in. to 6,764 ft. 5 in. a conglomerate assayed 1.1 dwt. over a core width of 11 in. or 13 in.-dwt. From 6,764 ft. 5 in. to 6,765 ft. 2 in. a quartzite band 9 in. wide disclosed no gold. From 6,765 ft. 2 in. to 6,766 ft. a conglomerate assayed 8.7 dwt. over a core width of 10 in., or 87 in.-dwt. These intersections were made on the Leader reef and the core recovery was complete. The Basal reef from 6,930 ft. 1 in. to 6,930 ft. 7 in. assayed 31 dwt., over a core width of 6 in. The core recovery was complete and no deflection of this borehole will be made. This borehole was drilled under supervision of General Mining & Finance Corporation for the joint account of "Geoffries" and Middle Wits.

Anglo-Transvaal Consolidated and Strathmore Consolidated have announced that in borehole BU.5, located on farm Buffelsfontein 75 in the Lucas Block, Klerksdorp district, Transvaal, the Vaal reef was intersected at 8,251 ft., assaying 17.92 dwt., over a corrected width of 21.3 in., equivalent to 382 in.-dwt. Core recovery was nearly complete and a deflection will be made. This borehole is being drilled by Middle Wits on behalf of itself and New Pioneer. Other companies interested are Anglo-Transvaal Consolidated, Eastern Rand Extensions, Strathmore Consolidated, Southern Van Ryn and Alpha Free State.

Welkom Gold Mining, in its December quarterly report, announced that borehole No. 1 on the farm Alma 64, intersected the Basal reef at a depth of 1,208 ft., giving an average assay of 3.5 dwt., over a true width of 51.6 in., or 181 in.-dwt. The Basal reef was intersected at 1,295 ft., assaying 112 dwt., over a true width of 10.9 in. equivalent to 1,221 in.-dwt. The core recovery was complete.

Freddies North Lease Area have announced that the Basal Reef was intersected on the north side of No. 2 Shaft at a depth of 5,014 ft. below the collar and a full exposure of the Reef over the perimeter of the shaft was completed at a depth of 5,020 ft. The Reef was sampled at 24 ft. intervals and the 49 sections sampled gave an average value of 2.33 dwt. over a width of 28.1 in., equivalent to 65 in.-dwt. Four consecutive sections in the north-eastern corner of the Shaft were all payable and averaged 10.93 dwt. over 32.8 in., equivalent to 358 in.-dwt. The "A" Reef was encountered at a depth of 4,504 ft. and gave an average value of 15.64 dwt. over 5.2 in., equivalent to 81 in.-dwt. The "B" Reef was encountered at a depth of 4,711 ft. and gave an average value of 8.15 dwt. over 19.8 in., equivalent to 161 in.-dwt. In addition, a mineralized conglomerate overlying the "A" Reef occurred at a depth of 4,496 ft. and assayed 2.2 dwt. over a width of 72 in., equivalent to 158 in.-dwt.

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WESTMINSTER BANK LTD.

The Annual General Meeting of Westminster Bank Ltd., will be held at the Head Office, 41, Lothbury, E.C.2, on February 13.

The following is an extract from the Statement: by the chairman, the Rt. Hon. Lord Aldenham, which was circulated with the report and accounts.

The Profit and Loss Account shows a profit of £1,405,453, a decrease of £65,578 compared with 1950.

Our operating expenses, mainly Staff costs, continued to rise, but our earnings rose also; and we should have been able to show an increased profit, in spite of increased taxation, but for the most unwelcome fall in the prices of British Government securities, which persisted throughout the year and, in the later months, became accentuated. This fall in British Government securities necessitated also a large encroachment upon our internal reserves.

A notable feature of the 1951 Balance Sheet is a rise of nearly £54,000,000 in the item "Advances to Customers and Other Accounts," although it should be stated that a large proportion of this increase is due to borrowings by Public Authorities. Whilst the continued upward trend in advances to industry and trade was to be expected, it would have been appreciably larger had it not been for the Bank's compliance with the official policy of restraint upon lending.

In November, H.M. Treasury decided to fund £1,000,000,000 of Treasury Bills by an issue of an equivalent amount of Serial Funding Loan Stock. By this means the Treasury has brought about a severe curtailment in the capacity of the banks to make further advances, and I am afraid that many would-be borrowers will find that it will be even harder for them to obtain from us financial assistance which they may well consider to be merited.

The deterioration in our national affairs which the year 1951 has brought about is very much in all our minds. The Prime Minister told us in November that on the then existing trends and policies the United Kingdom would have in 1952 a deficit on its general balance of payments of between £500,000,000 and £600,000,000 while the loss to the central gold and dollar reserve of the sterling area might be appreciably more.

How gravely different a picture this gives compared with 1950, when the balance of payments for the United Kingdom showed a surplus of £221,000,000, and the sterling area as a whole earned a gold and dollar surplus of £287,000,000, exclusive of Marshall Aid.

The new Government has already taken two very important steps towards meeting our dangerous situation in making drastic cuts in our imports and in restricting credit for non-essential purposes. But it cannot even be hoped that these steps will be sufficient by themselves, and we have been warned by the Prime Minister of the need for further unpleasant action which the Government will have to take early this year.

It is greatly to be hoped that during 1952 we shall give up any complacency induced by the expression "the terms of trade have moved against us"—as if that were an adequate excuse for failure to balance our external accounts. No business could survive for long which attempted to explain losses year after year by the fact that the terms of trade had moved against it; it would have to examine its buying and its selling methods, and above all its costs, and by economy or by increased productivity bring its accounts into balance. The nation must do the same. We have done much of which we may be proud in the way of increasing the volume of our exports since the war, but not yet enough, and 1952 will provide a challenge to British industry—a challenge in which the stakes are our standard of living.

The figures so far available for 1951 show that we have been trying to maintain living standards by the perfectly simple, and in the end perfectly ineffective, method of raising money wages and salaries to meet rises in the cost of living. In almost every month from January to November the cost of living has gone up, and weekly wage rates have gone up more or less similarly. The increases in wages themselves cause further rises in prices, and rising prices lead to continuous and successful pressure for higher wages; and that pressure cannot fairly be resisted by any one industry alone. The process is clearly illustrated by the increases in the cost of coal and railway transport which almost immediately followed the rises in wages agreed with the coal miners and railwaymen in November. Moreover higher prices in one part of the economy quickly spread to other parts; for example, the expected rise in the cost of gas is mainly attributable to the higher cost of coal delivered at the gas-works.

The stabilization of wages, and of money incomes generally, initiated by Sir Stafford Cripps, resulted in a temporary stability of the cost of living; but this policy was allowed to lapse, and we are now back in the old inflationary spiral. In these circumstances increases in incomes and wages, unless they are more than fully compensated by extra output, represent a hopeless attempt to evade the logic of our present situation, which demands that personal consumption should be reduced so that our essential imports may be paid for and the expenditure on defence met.

Indeed in the near future such increase in production as we may be able to secure can do little more than mitigate that reduction—except in the case of coal, where any increase in output produces most significant effects. Every increase in earnings, when not matched by increased production, lowers the purchasing power of the pound sterling and ultimately places a strain on its value in the foreign exchange market—and this at a time when all our efforts should be devoted to stabilizing the value of our currency at home and abroad.

The solution of most of our economic problems lies ultimately in an increase of production. There has been an increase of over 40 per cent in total industrial production since the war—an increase which unfortunately has been slowing down of late because of various shortages. But the numbers of employed have also grown since the war. The output of the individual worker has been rising, but not very fast, and is still demonstrably insufficient for our abnormal needs. Since we already have a condition of full employment, we must secure an even greater output from our present labour force.

We ought to be able to learn something from the country whose industrial output has been sufficient not only to support a high standard of living, but also to permit assistance on a most generous scale to ourselves and to other countries. In the reports of the teams which have been visiting the United States under the auspices of the Anglo-American Productivity Council, great stress is laid on the need for careful training in the technique of management at all levels, and on the understanding by American labour of how much high productivity and low costs benefit worker and employer alike. Individual output in America is fostered by a more even gradation of income tax, which leaves the worker a larger proportion of any additional earnings to spend as he pleases and makes the increased reward for extra responsibility more attractive than it is here.

There has been a most welcome increase of 6,000,000 tons in the total output of coal in 1951 compared with 1950, and the highest estimate of output given in the Economic Survey has been surpassed. But it is in relation to the needs of our situation that we should judge the present volume of output rather than by reference to past performance. When we consider the improvement in the economic affairs of our own country and of all Western Europe which could be brought about by an extra 20,000,000 tons of British coal, we see the matter in a truer perspective. Our own imports of coal from the United States in the first 11 months of 1951 cost about \$20,000,000. Total imports of coal into Western Europe from the same source during the year amounted to some 25,000,000 tons and cost about \$500,000,000. If these needs could be met with coal from this country, the dollar problem of Western Europe, including the United Kingdom, would be far less formidable.

The need to defend the present exchange value of the pound sterling is very clear, and in this respect a very special responsibility rests with the United Kingdom in view of our position as banker to the sterling area. The remedial measures already adopted by the Government and the foreshadowing of others to follow may be taken as a token of our determination to defend the value of the pound and to restore its prestige throughout the world.

The need to preserve the internal purchasing power of our currency is scarcely less urgent. The question of how to check the constant tendency for prices to rise, which seems inherent in the condition of full employment, is one of the major problems of our times, and one which by no means concerns this country alone. A real injustice is inflicted on all individuals whose incomes are fixed; and the rise in prices is a factor which is constantly in our minds in the Bank in trying to hold the balance fairly between our Staff salaries and our earning powers.

The effect of falls in the purchasing power of money upon savings is particularly harmful.

There is an ingrained habit of thrift among the British people which could do much to check the immediate evils of inflation if it were again encouraged, or were not at least actively discouraged by the instability of the currency as in recent years. The net additions year by year to National Savings have dwindled from £444,000,000 in 1946 to the tiny figure of £3,500,000 (after allowing for repayment of Defence Bonds) in 1951, and we shall have lost a most valuable weapon against inflation if this trend is not soon reversed.

We cannot but welcome the return to a flexible Bank Rate as a measure against inflation. British banking may justly claim that the technique of the Bank Rate was first evolved in this country; but this essential part of the mechanism of credit control has for too long remained idle. Whatever justification there may have been for not using the Bank Rate in circumstances in which the need was to stimulate demand, there can be none at present when the need is, on the contrary, to damp down excessive demand.

A rise in the Bank Rate was formerly accepted by the business world as a sign that a contraction of credit was needed and was imminent, and the business world quickly responded. The recent return to a policy of a flexible Bank Rate has been accepted as such a sign, and has proved, with the other measures taken at the same time, more significant than the actual rise in the rate.

TANGANYIKA CONCESSIONS LTD.

The Annual General Meeting of Tanganyika Concessions, Ltd., was held on January 17 in Salisbury, Southern Rhodesia, Mr. Maurice Hely-Hutchinson (the chairman) presiding.

The following is an extract from his circulated review:—

The shareholders of the Union Minière du Haut Katanga have approved the payment of an interim dividend of 500 fcs. per Part Sociale in respect of the year 1951, as compared with the interim dividend of 400 fcs. in respect of 1950. The Board of the Union Minière Company has announced that it anticipates that copper production during 1951 will reach about 185,000 tons, as against 175,920 tons in 1950.

The international and mineral traffic moving over the Benguela Railway has continued to show substantial increases during the first ten months of 1951. In order to place the line in a position to carry the increasing tonnages envisaged in the future, further capital expenditure will be required. We have, therefore, during 1951 opened negotiations with the Portuguese Government for the protection of your interests in respect of this expenditure. These approaches have received a sympathetic response, and we are hopeful that agreement will be reached in the near future on a satisfactory basis. It is our hope that these additional capital requirements can be financed out of the earnings of the railway, but this will depend upon the time at which materials and supplies ordered are delivered.

This is the first annual meeting to be held at the company's principal office in Salisbury since the transfer of the seat of management and control to Southern Rhodesia.

It is the hope of the Board that your company will take part in the future development of the Rhodesias, and that an increasing part of the share capital of the company will come to be held not only in Rhodesia, but also in other parts of Central and Southern Africa.

Major Sir Richard Proby, chairman of the United Kingdom Ordinary Stockholders' Committee, congratulated the Board on the successful accomplishment of the transfer of the company's seat of management to Southern Rhodesia and upon the satisfactory results from the stockholders' point of view.

The Chairman, in reply, said that there could be no question that the move had greatly benefited the stockholders and he was confident that, as a result of it, a widening range of opportunity, in new fields in Africa, lay before the company.

The report was adopted.

APEX (TRINIDAD) OILFIELDS

The Thirty-Second Annual Ordinary General Meeting of Apex (Trinidad) Oilfields, Ltd., was held in London on Wednesday last.

Mr. Malcolm MacLachlan (Chairman) who presided, in the course of his speech, said:—

Oil revenue, after provision for development and contingencies, staff pensions and depreciation of fixed assets, amounted to £1,595,000. The revenue was derived entirely from the oil delivered during the year, whereas that of the previous year included £408,000 in respect of deliveries in prior years. Apart from this factor the oil revenue thus showed an increase of approximately £300,000. The net profit for the year was £530,000.

The Directors recommended the payment of a final dividend of 1s. 6d. free of income tax making a total dividend for the year of 2s. free of income tax. The unappropriated profit to be carried forward would amount to £234,000.

The production for the year amounted to 3,082,000 barrels of crude oil and 3,886,000 gallons of casing head gasoline.

During the year 88,037 ft. had been drilled in continuance of the programme to obtain production and to extend the tested areas of the property. Six wells had been completed in the main field and four in the South Quarry area.

Recent developments in Trinidad were of considerable interest to the Company as the time approached to explore its property at still greater depth. The Company had on order the most modern type of diesel rig capable of drilling to a depth of 15,000 ft., which it was hoped would be delivered during the current year.

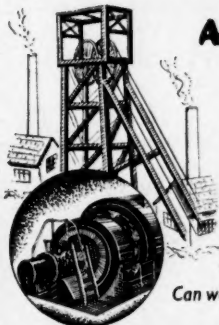
Costs during the past year had shown a sharp increase and the Chairman stressed the importance that all who were concerned with the industry, whether as management, government or leaders of organized labour, should do everything within their control to avoid building up a high cost structure.

The division of the profit for the year continued to provide a striking illustration of the benefit derived from the success of the Company's enterprise by the government and people of Trinidad.

The government of Trinidad, as sleeping partner in the oil business, now took by means of taxation over 60 per cent of the profits of the industry. Geological conditions in Trinidad were outstandingly difficult and the output per well averaged only about 25 barrels a day; nevertheless the revenue accruing to the government of Trinidad per barrel of oil produced compared very well with that received by owners of mineral rights in other and far more prolific oil-bearing countries.

The report and accounts were adopted.

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